CLAIMS

1. A tag (30) for electronic article identification, comprising at least two magnetic elements (31-36) representing an identity of the tag, or of an article (20) to which the tag is attached, said magnetic elements being electromagnetically detectable, **characterized** in that

the magnetic elements (31-36) are formed as wires made from an amorphous or nano-crystalline metal alloy;

the magnetic elements (31-36) are arranged at predetermined angles (α_1-α_6) to each other;

at least one of the magnetic elements (31-36) has a length (L_1-L_6), which is different from the length of at least one other magnetic element of the tag;

at least one of the magnetic elements (31-36) has a diameter (ϕ_1-ϕ_6), which is different from the diameter of at least one other magnetic element of the tag;

wherein the lengths and diameters of the magnetic elements, and the angles between them, jointly form the identity of the tag.

2. A tag according to claim 1, wherein the diameters (ϕ_1-ϕ_6) of the magnetic elements (31-36) are selected from a range between 10 and 100 μm.

3. A tag according to claim 1, wherein the lengths (L_1-L_6) of the magnetic elements (31-36) are selected from a range between 40 and 100 mm.

4. A tag according to any of claims 1-3, wherein each magnetic element (31-36) is provided with a coating of dielectric material, such as glass.

5. A tag according to any of claims 1-4, wherein the amorphous or nano-crystalline metal alloy of each magnetic element (31-36) exhibits a Giant Magnetoimpedance-effect

when exposed to electromagnetic energy (50) of high frequency and magnetic energy (H_{mod}) of lower frequency.

6. A tag according to any of claims 1-5, wherein the amorphous or nano-crystalline metal alloy of each magnetic element (31-36) has a majority ratio of cobalt.

7. A tag according to any of claims 1-6, wherein the composition of the amorphous or nano-crystalline metal alloy of each magnetic element (31-36) is $(Fe_{0.06}Co_{0.94})_{72.5}Si_{12.5}B_{15}$.

8. A method of encoding an identity code into an electronic article identification tag (30) having a plurality of magnetic elements (31-36), said identity code comprising a plurality of words at respective positions in a numeral system, each word being capable of storing one of *n* different values, **characterized** by the steps of

providing a first set of lengths (L) for magnetic elements;

providing a second set of diameters (D) for magnetic elements;

forming a third set of element types by associating one unique length among said first set of lengths (L), and one unique diameter among said second set of diameters (D), with each respective element type,

mapping each of said *n* different values to a respective element type;

providing a fourth set of angular positions (A) for magnetic elements;

arranging in said tag, for each word in said identity code, a magnetic element of the type corresponding to the value of the word, at one angular position among said fourth set of angular positions.

9. An article identification apparatus, where an individual article (20) is provided with a tag (30) comprising a plurality of angularly arranged magnetic elements (31-36), the apparatus comprising transmitter means (11, 13) for transmitting a first electromagnetic signal (50) in a detection zone (10); receiver means (12, 15) for receiving a second electromagnetic signal (60, 70), generated by the tag in response to the first electromagnetic signal from the transmitter means; modulating means (16) for generating a magnetic field (H_{mod}) for modulating the second electromagnetic signal during the generation thereof by the tag; demodulating means (15) for producing a reply signal (80) by demodulating the second electromagnetic signal (70) as received by the receiver means; and a controller (14) operatively connected to the demodulating means; **characterized** in that

the modulating means (16) is arranged to generate a magnetic modulating field (H_{mod}) having a rotating orientation, wherein the controller (14) is arranged to detect when a frequency shift occurs for the reply signal (80) and in response determine an angular position (α_i) of an individual magnetic element (i);

the modulating means (16) is arranged to generate a magnetic modulating field (H_{mod}) with increasing amplitude (ΔH_{ac}), wherein the controller (14) is arranged to determine a corresponding change in amplitude (ΔA) of the reply signal (80) and in response determine a length (L_i) of said individual magnetic element (i);

the modulating means (16) is arranged to generate a magnetic modulating field (H_{mod}) with increasing amplitude (H_{ac}), wherein the controller (14) is arranged to continuously monitor an amplitude of the reply signal (80) so as to detect a saturation point thereof and in response determine a diameter of said individual magnetic element (i); and

the modulating means (16) and the controller (14) are arranged to repeat the steps above for all magnetic elements (31-36) of the tag (30), wherein the controller (14) is arranged to determine an identity of the tag (30) from the angular positions (α_i), lengths (L_i) and diameters (ϕ_i) of the magnetic elements (31-36).

Add A1

add B1 ABSTRACT